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Report on Lake Vandalia Fayette County, Illinois Region V

National Eutrophication Survey, Corvallis, Oreg

Prepared for

Corvallis Environmental Research Lab, Oreg

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16. ABSTRACT

Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

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NATIONAL EUTROPHICATION SURVEY

WORKING PAPER SERIES





CORVALLIS ENVIRONMENTAL RESEARCH LABORATORY - CORVALLIS, OREGON
and
ENVIRONMENTAL MONITORING & SUPPORT LABORATORY - LAS VEGAS, NEVADA

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INFORMATION SERVICE

REPORT

ON

LAKE VANDALIA

FAYETTE COUNTY

ILLINOIS

EPA REGION V

WORKING PAPER No. 319

WITH THE COOPERATION OF THE

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

AND THE

ILLINOIS NATIONAL GUARD

JUNE, 1975

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to fresh water lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Illinois Environmental Protection Agency for professional involvement and to the Illinois National Guard for conducting the tributary sampling phase of the Survey.

Dr. Richard H. Briceland, Director of the Illinois Environmental Protection Agency, and Ronald M. Barganz, State Survey Coordinator, and John J. Forneris, Manager of Region III, Field Operations Section of the Division of Water Pollution Control, provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

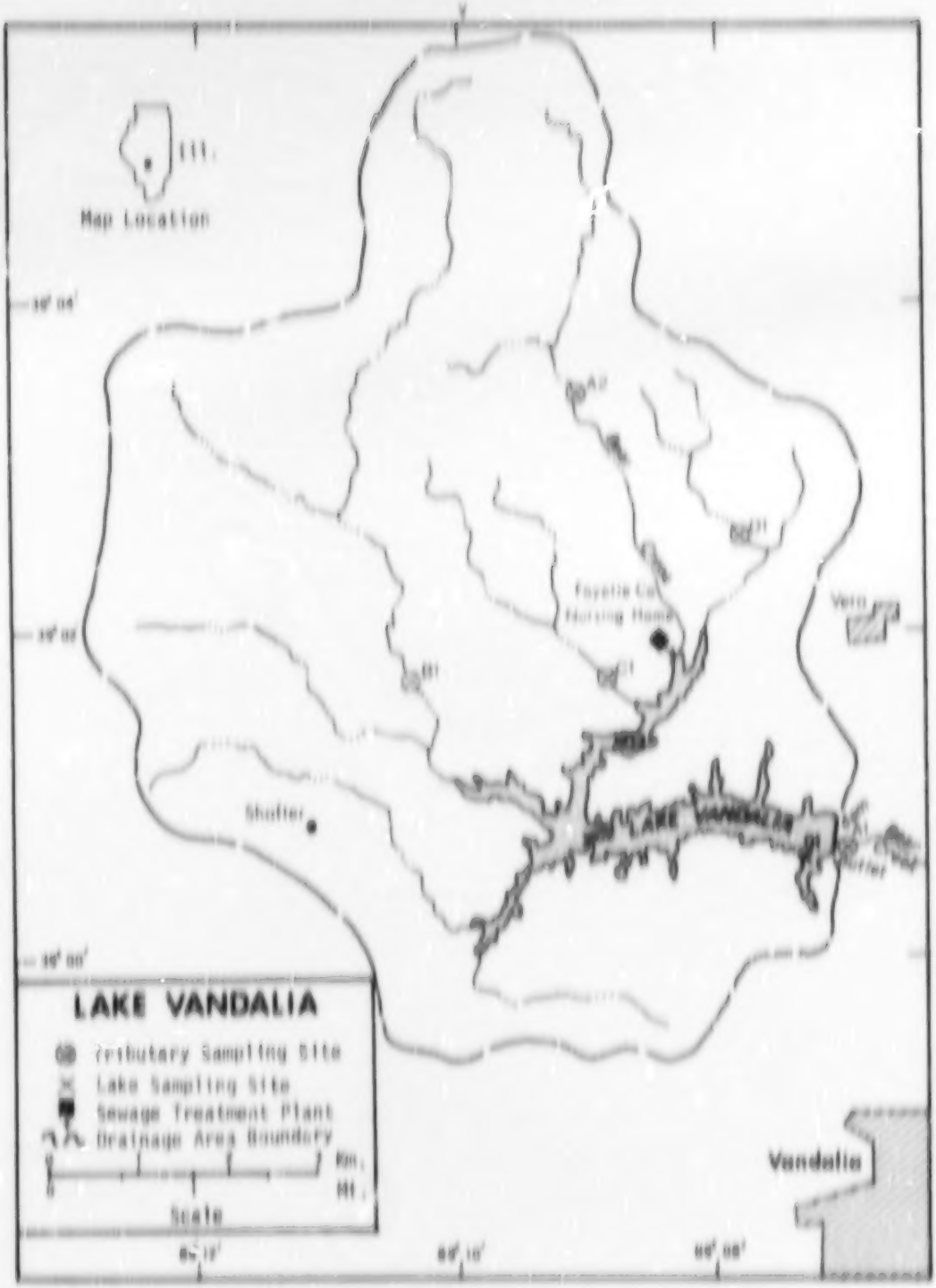
Major General Harold R. Patton, the Adjutant General of Illinois, and Project Officer Colonel Daniel L. Fane, who directed the volunteer efforts of the Illinois National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF ILLINOIS

LAKE NAME	COUNTY
Baldwin	Randolph
Bloomington	McLean
Carlyle	Bond, Clinton, Fayette
Cedar	Lake
Charleston	Coles
Coffeen	Montgomery
Crab Orchard	Jackson, Williamson
Decatur	Macon
DePue	Bureau
East Loon	Lake
Fox	Lake
Grass	Lake
Highland Silver	Madison
Holliday	LaSalle
Horseshoe	Madison
Long	Lake
Lou Yaeger	Montgomery
Marie	Lake
Old Ben Mine	Franklin
Pistakee	Lake, McHenry
Raccoon	Marion
Rend	Franklin, Jefferson
Sangchris	Christian
Shelbyville	Moultrie, Shelby
Slocum	Lake
Springfield	Sangamon
Storey	Knox
Vandalia	Fayette
Vermilion	Vermilion
Wee Ma Tuk	Fulton
Wonder	McHenry


Ill.
Map Location
39° 04'
39° 02'
39° 00'
Fayette Co.
Nursing Home
Vern
Shafter
LAKE VANDALIA
Vandalia
LAKE VANDALIA
Tributary Sampling Site
Lake Sampling Site
Sewage Treatment Plant
Drainage Area Boundary
Km.
Mi.
Scale
89° 12'
89° 10'
89° 08'

LAKE VANDALIA
STORET NO. 1764

I. CONCLUSIONS

A. Trophic Condition:

Survey data indicate that Lake Vandalia is eutrophic. Of the 31 Illinois water bodies sampled in 1973, Lake Vandalia ranked thirteenth in overall trophic quality based on an index of six parameters*. Sixteen of the lakes had less median total phosphorus, 12 had less median dissolved phosphorus, 12 had less median inorganic nitrogen, five had less mean chlorophyll a, and 12 had greater mean Secchi disc transparency. Marked depression of dissolved oxygen with depth occurred at sampling station 1 at all three sampling times and at station 2 in August, 1973.

Survey limnologists did not observe any nuisance conditions during their visits to the lake.

B. Rate-Limiting Nutrient:

The algal assay results indicate Lake Vandalia was phosphorus limited at the time the assay sample was collected (05/11/73). The lake data indicate phosphorus limitation at the other sampling times as well.

C. Nutrient Controllability:

1. Point sources--The Fayette County Nursing Home was the only known point source impacting Lake Vandalia during the sampling year

* See Appendix A.

and is estimated to have contributed 3.6% of the total phosphorus load.

The present phosphorus loading rate of 0.96 g/m²/yr (see page 13) is more than two times that proposed by Vollenweider (Vollenweider and Dillon, 1974) as a eutrophic rate. Therefore, all phosphorus inputs should be minimized to the greatest practicable extent.

2. Non-point sources--The gaged tributaries of Lake Vandalia contributed 44.8% of the total phosphorus loading. The minor tributaries and immediate drainage were estimated to have contributed 49.6% of the total load.

The phosphorus export rates of the tributaries (see page 13) are comparable to the rates of other unimpacted streams elsewhere in the Kaskaskia River drainage; e.g., the export rate of Blue Grass Creek (a tributary of nearby Lake Lou Yaeger*) was 39 kg/km² during the Survey sampling year.

* Working Paper No. 310.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS†

A. Lake Morphometry††:

1. Surface area: 2.67 kilometers².

2. Mean depth: 16.2 meters.

3. Maximum depth: >16.2 meters.

4. Volume: 43,246 x 10^3 m^3.

5. Mean hydraulic retention time: 3.4 years.

B. Tributary and Outlet;
(See Appendix C for flow data)

1. Tributaries -

Name	Drainage area (km^2)*	Mean Flow (m^3/sec)*
Bear Creek	9.2	0.1
Unnamed Creek (B-1)	13.3	0.1
Unnamed Creek (C-1)	4.4	<0.1
Unnamed Creek (D-1)	3.1	<0.1
Minor tributaries & immediate drainage -	40.2	0.2
Totals	60.2	0.4

2. Outlet -

Bear Creek	62.9**	0.4

C. Precipitation***:

1. Year of sampling: 130.3 centimeters.

2. Mean annual: 93.6 centimeters.

† Table of metric conversions--Appendix B.
†† Forneris, 1973.
* For limits of accuracy, see Working Paper No. 175, "...Survey Methods, 1973-1976".
** Includes area of lake.
*** See Working Paper No. 175.

III. LAKE WATER QUALITY SUMMARY

Lake Vandalia was sampled three times during the open-water season of 1973 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from three stations on the lake and from a number of depths at each station (see map, page v). During each visit, a single depth-integrated (4.6 m or near bottom to surface) sample was composited from the stations for phytoplankton identification and enumeration; and during the first visit, a single 18.9-liter depth-integrated sample was composited for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll *a* analysis. The maximum depths sampled were 9.8 meters at station 1, 4.0 meters at station 2, and 1.2 meters at station 3.

The results obtained are presented in full in Appendix D and are summarized in the following table.

B. Biological characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal units per ml
09/11/73	1. Trachelomonas sp.	133
	2. Cryptomonas sp.	133
	3. Dactylococcopsis sp.	133
	4. Flagellates	89
	5. Cyclotella sp.	44
	Other genera	44
	Total	576
08/10/73	1. Coelosphaerium sp.	712
	2. Blue-green Filaments	269
	3. Melosira sp.	192
	4. Cyclotella sp.	135
	5. Merismopedia sp.	116
	Other genera	153
	Total	1,077
10/16/73	1. Microcystis sp.	974
	2. Coelosphaerium sp.	799
	3. Flagellates	174
	4. Schroederia sp.	145
	5. Cryptomonas sp.	131
	Other genera	568
	Total	2,791

2. Chlorophyll a -

Sampling Date	Station Number	Chlorophyll a (ug/l)
05/11/73	01	2.0
	02	1.4
	03	11.5
08/10/73	01	6.0
	02	6.1
	03	31.3
10/10/73	01	10.1
	02	12.3
	03	18.0

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.020	0.760	9.8
0.050 P	0.070	0.760	22.2
0.050 P + 1.0 N	0.070	1.760	37.3
1.0 N	0.020	1.760	9.4

2. Discussion -

The control yield of the assay alga, Selenastrum capricornutum, indicates that the potential primary productivity of Lake Vandalia was high at the time the assay sample was collected (05/11/73). The results also indicate that the lake was phosphorus limited at that time. Note the lack of a significant increase in yield with the addition of nitrogen only, but the addition of orthophosphorus alone or in combination with nitrogen resulted in a marked yield increase.

The lake data indicate phosphorus limitation at the other sampling times as well. The inorganic nitrogen to orthophosphorus ratio was 22 to 1 in August and in October, and phosphorus limitation would be expected.

IV. NUTRIENT LOADINGS
(See Appendix E for data)

For the determination of nutrient loadings, the Illinois National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff months of February and March when two samples were collected. Sampling was begun in June, 1973, and was completed in May, 1974.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Illinois District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. Nutrient loads shown are those measured minus point-source loads, if any.

Nutrient loads for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the means of the nutrient loads, in kg/km^2/year, at stations A-2, B-1, and C-1 and multiplying the means by the ZZ area in km^2.

The Fayette County Nursing Home did not participate in the survey, and nutrient loads were estimated at 1.134 kg P and 3.401 kg N/capita/year.

* See Working Paper No. 175.

A. Waste Sources:

1. Known domestic* -

Name	Pop. Served	Treatment	Mean Flow (m^3/d)	Receiving Water
Fayette Co. Nursing Home	80	ponds	30.3**	Bear Creek

2. Known industrial - None

* Barquez, 1975.
** Estimated at 0.3785 m^3/capita/day.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	kg P/ yr	% of total
a. Tributaries (non-point load) -		
Bear Creek	310	12.1
Unnamed Creek (B-1)	485	18.9
Unnamed Creek (C-1)	180	7.0
Unnamed Creek (D-1)	180	7.0
b. Minor tributaries & immediate drainage (non-point load) -	1,275	49.6
c. Known domestic STP's -		
Fayette Co. Nursing Home	90	3.5
d. Septic tanks* -	5	0.2
e. Known industrial - None	-	-
f. Direct precipitation** -	45	1.7
Total	2,570	100.0

2. Outputs -

Lake outlet - Bear Creek 2,260

3. Net annual P accumulation - 310 kg.

* Estimate based on 25 lakeshore dwellings; see Working Paper No. 175.
** See Working Paper No. 175.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	kg N/ yr	% of total
a. Tributaries (non-point load) -		
Bear Creek	3,960	13.4
Unnamed Creek (B-1)	5,500	18.6
Unnamed Creek (C-1)	1,760	5.9
Unnamed Creek (D-1)	1,620	5.5
b. Minor tributaries & immediate drainage (non-point load) -	13,575	46.0
c. Known domestic STP's -		
Fayette Co. Nursing Home	270	0.9
d. Septic tanks* -	265	0.9
e. Known industrial - None	-	-
f. Direct precipitation** -	2,885	9.9
Total	29,495	100.0

2. Outputs -

Lake outlet - Bear Creek 27,555

3. Net annual N accumulation - 1,940 kg.

* Estimate based on 25 lakeshore dwellings; see Working Paper No. 175.
** See Working Paper No. 175.

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

Tributary	kg P/km²/yr	kg N/km²/yr
Bear Creek	34	430
Unnamed Creek (B-1)	36	414
Unnamed Creek (C-1)	41	391
Unnamed Creek (D-1)	58	523

E. Yearly Loading Rates:

In the following table, the existing phosphorus loading rates are compared to those proposed by Vollenweider (Vollenweider and Dillon, 1974). Essentially, his "dangerous" rate is the rate at which the receiving water would become eutrophic or remain eutrophic; his "permissible" rate is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic rate would be considered one between "dangerous" and "permissible".

Note that Vollenweider's model may not be applicable to water bodies with short hydraulic retention times.

	Total Phosphorus		Total Nitrogen	
	Total	Accumulated	Total	Accumulated
grams/m²/yr	0.96	0.12	11.0	0.7

Vollenweider loading rates for phosphorus ($g/m^2/yr$) based on mean depth and mean hydraulic retention time of Lake Vandalia:

"Dangerous" (eutrophic rate)	0.42
"Permissible" (oligotrophic rate)	0.21

V. LITERATURE REVIEWED

Bargana, Ronald M., 1975. Personal communication (point source impacting Lake Vandalia). IL Env. Prot. Agency, Springfield.

Forneris, John J., 1973. Personal communication (lake morphometry). IL Env. Prot. Agency, Springfield.

Vollenweider, R. A., and P. J. Dillon, 1974. The application of the phosphorus loading concept to eutrophication research. Natl. Res. Council of Canada Publ. No. 13690, Canada Centre for Inland Waters, Burlington, Ontario.

VI. APPENDICES

APPENDIX A

LAKE RANKINGS

[illegible] DATA TO BE USED IN REMARKS

LAKE CODE	LAKE NAME	[illegible] DATA, °	[illegible] [illegible] °	[illegible] [illegible] SEC	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible] [illegible] °
[illegible]	[illegible] [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] [illegible] [illegible] [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P	INDEX NO
1764	LAKE MAGNOLIA	47 (144)	40 (120)	46 (139)	83 (251)	13 (2)	60 (180)	323
[illegible]	[illegible] RESERVOIR	8 (5)	83 (251)	57 (171)	40 (121)	60 (180)	0 (0)	240
[illegible]	[illegible] LAKE	44 (133)	57 (171)	37 (110)	3 (2)	93 (280)	80 (24[illegible])	333

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
29	1725	LONG LAKE	145
30	1750	WONDER LAKE	143
31	1752	DEPUE LAKE	139

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX C

TRIBUTARY FLOW DATA

APPENDIX D

PHYSICAL and CHEMICAL DATA

[illegible]

APPENDIX C

TRIBUTARY DATA

STORET RETRIEVAL DATE 75/10/27

175641
39 00 40.0 089 07 00.0
BEAR CREEK
17051 FAYETTE CO MAP
UPVANDALIA LAKE
BRUS 2 MI N OF VANDALIA CITY LIMITS
11EPALES 2111204
0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/06/02	14 05		0.720	1.490	0.115	0.052	0.150
73/07/07	09 50		0.380	3.360	0.105	0.016	0.040
73/08/04	10 00		5.110	1.540	0.020	0.025	0.025
73/09/17	13 15		0.210	0.670	0.075	0.020	0.045
73/10/13	16 00		0.290	1.100	0.027	0.022	0.125
73/11/03	11 00		0.176	1.500	0.101		0.200
73/12/01	10 45		0.350	0.900	0.040	0.029	0.236
74/01/05	11 05		0.500	2.100	0.076	0.036	0.275
74/02/02	11 30		0.424	0.600	0.095	0.115	0.170
74/02/15	11 00		0.424	1.200	0.105	0.085	0.160
74/03/02	11 05		0.450	1.600	0.045	0.005	0.216
74/03/16	10 30		1.060	1.000	0.075	0.475	0.145
74/04/04	16 00		1.120	1.200	0.030	0.065	0.176
74/05/04	14 20		0.475	2.700	0.200	0.085	0.160

[illegible]

[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

DATE	TIME	DEPTH	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
FROM	OF		[illegible]	%	TOTAL	(MTHS)	
TO	DAY	FEET	MG/L	MG/L	MG/L	MG/L P	MG/L P
[illegible]	14	35	0.158	1.348	0.961	0.835	0.960
[illegible]	10	20	0.166	3.280	0.110	0.825	0.850
[illegible]	12	30	0.154	4.388	0.296	0.109	0.260
[illegible]	13	40	0.050	1.439	0.379	0.895	0.216
[illegible]	10	00	0.050	0.920		0.940	0.105
[illegible]	11	32	0.750	0.980	0.032	0.224	0.440
[illegible]	11	35	2.100	2.106	0.720	0.290	0.330
[illegible]	12	39	1.250	0.380	0.830	0.870	0.875
[illegible]	13	30	0.750	0.965	0.050	0.855	
[illegible]	11	55	1.090	1.100	0.945	0.950	0.115
[illegible]	11	05	0.605	1.500	0.945	0.105	0.220
[illegible]	11	50	0.980	1.405	0.230	0.845	0.895
[illegible]	14	20	0.154	1.790	0.380	0.820	0.845

STORET RETRIEVAL DATE 75/10/23

[illegible]
39 01 40.0 089 10 20.0
UNNAMED STREAM
17 FAYETTE CO [illegible]
T/V/RADELIA LAKE
2NDAY RD SHED : MI [illegible] OF LAKE
USGS-PALES 2111204
[illegible] 4000 FEET [illegible]

DATE FROM TO	TIME OF DAY	DEPTH FEET	[illegible] WATER MG/L	[illegible] TOT KJEL MG/L	[illegible] MG/L	[illegible] NH3-NIS DATAC MG/L P	[illegible] NH3-TOT MG/L P
73/04/02	15 10		0.450	1.500	0.044	0.031	0.040
73/07/07	10 40		0.450	5.700	0.147	0.044	0.065
73/08/04	12 00		0.645	2.400	0.059	0.059	0.075
73/04/17	14 00			0.600	0.015	0.015	0.041
73/10/13	14 30		0.220	5.600	2.300	0.034	0.040
73/11/13	12 30		0.250	1.800	0.040		0.215
73/12/01	12 30		0.540	1.486	0.040	0.044	0.590
74/01/05	12 05		1.250	1.200	0.000	0.072	0.095
74/02/02	13 00		0.740	0.400	0.035	0.045	0.105
74/02/15	11 00		0.390	1.400	0.075	0.030	0.105
74/03/02	12 20		0.430	1.400	0.055	0.050	0.140
74/03/26	12 20		0.440	1.500	0.052	0.130	0.010
74/04/04	13 00		0.500	0.700	0.035	0.060	0.115
74/05/04	14 45		0.200	0.500	0.035	0.025	0.045

[illegible]

17[illegible]
39 01 48.6 089 00 50.0
[illegible]
17 FAYETTE CO [illegible]
[illegible]
2[illegible] 40 [illegible] 0.2 MI [illegible] OF [illegible]
[illegible] 211120[illegible]
[illegible] [illegible] FEET [illegible]

DATE	TIME	DEPTH	00626	00625	00610	00671	00665
			NITROGEN,	TOT KJEL	NH3+NH4	PHOS-DIS	PHOS-TOT
FROM	OF		AMMONIA +	N	TOTAL	ORTHO	
TO	DAY	FEET	MG/L	MG/L	MG/L	MG/L P	MG/L P
73/06/02	14	50	0.115	2.310	0.096	0.020	0.220
73/07/07	10	30	0.310	3.400	0.170	0.030	0.260
73/08/04	12	15	0.420	2.970	0.066	0.040	0.285
73/09/17	13	50	0.190	1.290	0.072	0.050	0.175
73/10/13	17	25	0.240	1.300	0.091	0.015	0.160
73/11/03	12	00		1.150	0.052		0.230
73/12/01	12	00	0.400	1.100	0.052	0.140	0.250
74/01/05	13	15	1.120	1.200	0.072	0.132	0.200
74/02/02	12	30	0.320	0.900	0.250	0.050	0.125
74/02/25	11	45	1.040	1.400	0.230	0.105	0.290
74/03/02	12	45	0.840	0.900	0.230	0.070	0.130
74/04/06	12	00	0.220	1.400	0.056	0.040	0.175
74/05/04	14	30	0.102	1.400	0.040	0.017	0.155

[illegible]

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[illegible]

DATE FROM TO	TIME OF DAY	FLOW RATE	[illegible] TOTAL	[illegible] TOT KJEL N	[illegible] TOTAL	[illegible] NO3-NO2	[illegible] NO2-TOT
			MG/L	MG/L	MG/L	MG/L N	MG/L P
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

* [illegible]
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